**Optics laboratories II**

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<table>
<thead>
<tr>
<th>Cursus</th>
<th>Sem.</th>
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<tr>
<td>Microtechnique</td>
<td>MA1, MA3</td>
<td>Opt.</td>
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<tr>
<td>Photonics minor</td>
<td>H</td>
<td>Opt.</td>
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**Language**: English  
**Credits**: 3  
**Session**: Winter  
**Semester**: Fall  
**Exam**: During the semester  
**Workload**: 90h  
**Weeks**: 14  
**Hours**: 3 weekly  
**Practical work**: 3 weekly  
**Number of positions**:

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**Summary**

This laboratory work allows students to deepen their understanding of optical instruments, optoelectronic devices and diagnostic methods. Students will be introduced in state of the art optical instruments and measurement principles.

**Content**

4 experiments on optics

**Keywords**

Optical instruments, optical measurement techniques, Diode laser, He-Ne laser, Fourier optics, waveguide and fiber optics, error analysis

**Learning Prerequisites**

**Required courses**

- MICRO-420: Advanced optics
- MICRO-421: Imaging optics
- MICRO-422: Lasers and optics of nanostructures
- MICRO-522: Integrated optics
- MICRO-523: Optical radiation detection methods
- MICRO-321 Optical engineering I
- MICRO-321 Optical engineering II
- MICRO-424: Optics laboratories I

**Recommended courses**

**Bachelor in**

- Microengineering, or
- Electrical and electronic engineering, or
- Physics.

**Important concepts to start the course**

Basics of optics, programming with MATLAB or similar, matrix calculations, Fourier transformation, electromagnetic waves, refraction and reflection, polarization, basics of geometrical optics, semiconductor physics, laser physics, error analysis

**Learning Outcomes**
By the end of the course, the student must be able to:

- Apply principles of laser security
- Perform data analysis using Excel and Matlab
- Assess / Evaluate the reliability of measurements
- Perform an optical measurement
- Interpret measurement results
- Estimate measurement errors

Transversal skills

- Manage priorities.
- Communicate effectively, being understood, including across different languages and cultures.
- Use both general and domain specific IT resources and tools
- Continue to work through difficulties or initial failure to find optimal solutions.
- Demonstrate the capacity for critical thinking
- Take feedback (critique) and respond in an appropriate manner.

Teaching methods

- Practical laboratory work in group (2 persons)
- 4 Experiments (2 afternoons)

Expected student activities

Individual activity
- Participation at all experiments
- Execution of practical work
- Keep a Laboratory note book

Group activity
- Scientific/technical report writing per experiment

Assessment methods

Discussion of basic concepts during instruction (individual)
Evaluation of experimental work (individual)
Evaluation of written report (group)
Evaluation of laboratory notebook (individual)

Resources

Bibliography
Fundamentals of optical waveguides / Katsunari Okamoto, 2006
Fundamentals of photonics / B.E.A. Saleh, M. C. Teich, 2007

Ressources en bibliothèque
- Fundamentals of photonics / Saleh
- Integrated optics: theory and technology / Hunsperger
- An introduction to error analysis: the study of uncertainties in physical measurements / Taylor,
- Fundamentals of optical waveguides / Okamoto
Notes/Handbook
Handout of course slides and documentation of individual experiments